CHAPTER 7

FIRE-FIGHTING SYSTEM

This chapter describes the operation and required maintenance of the fire-fighting system and equipment aboard the 100-ton floating crane after its rehabilitation under the PIP.

SYSTEM LAYOUT

FIRE-MAIN SYSTEM

The fire-main system consists of three fixed fire stations, the fire pump, and the necessary piping components. The fire stations are located in the following strategic locations:

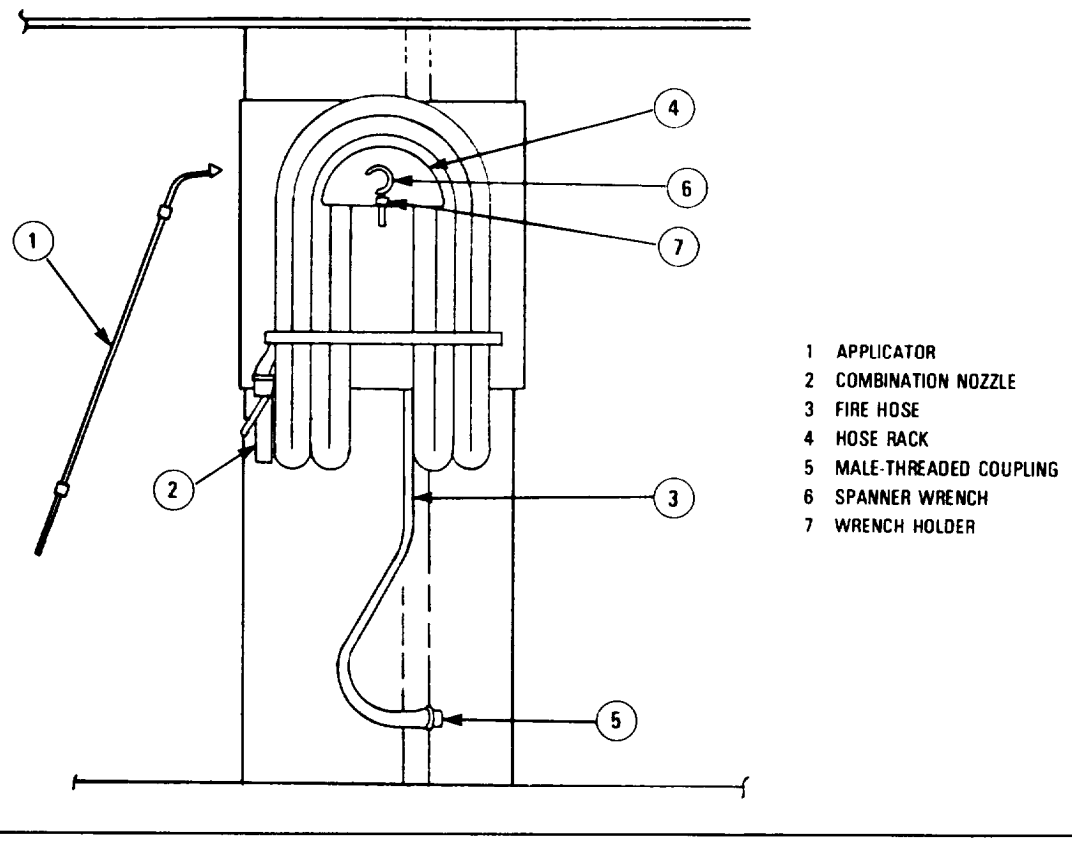
Ž Fire station 1: in the engine room above the fire pump on the starboard bulkhead.

• Fire station 2: in the crew's berthing area, forward of the entrance to the shower and toilet room.

• Fire station 3: on the main deck on the rotary platform base, at about frame 12.

Each fire station is equipped with a 50-foot, 1 l/2-inch hose permanently installed on a hose rack. Each hose has a combination nozzle attached to it. In addition, there is an applicator nozzle located at each station. A spanner wrench of the exact size required is permanently attached to the hose rack. Refer to the following illustration.

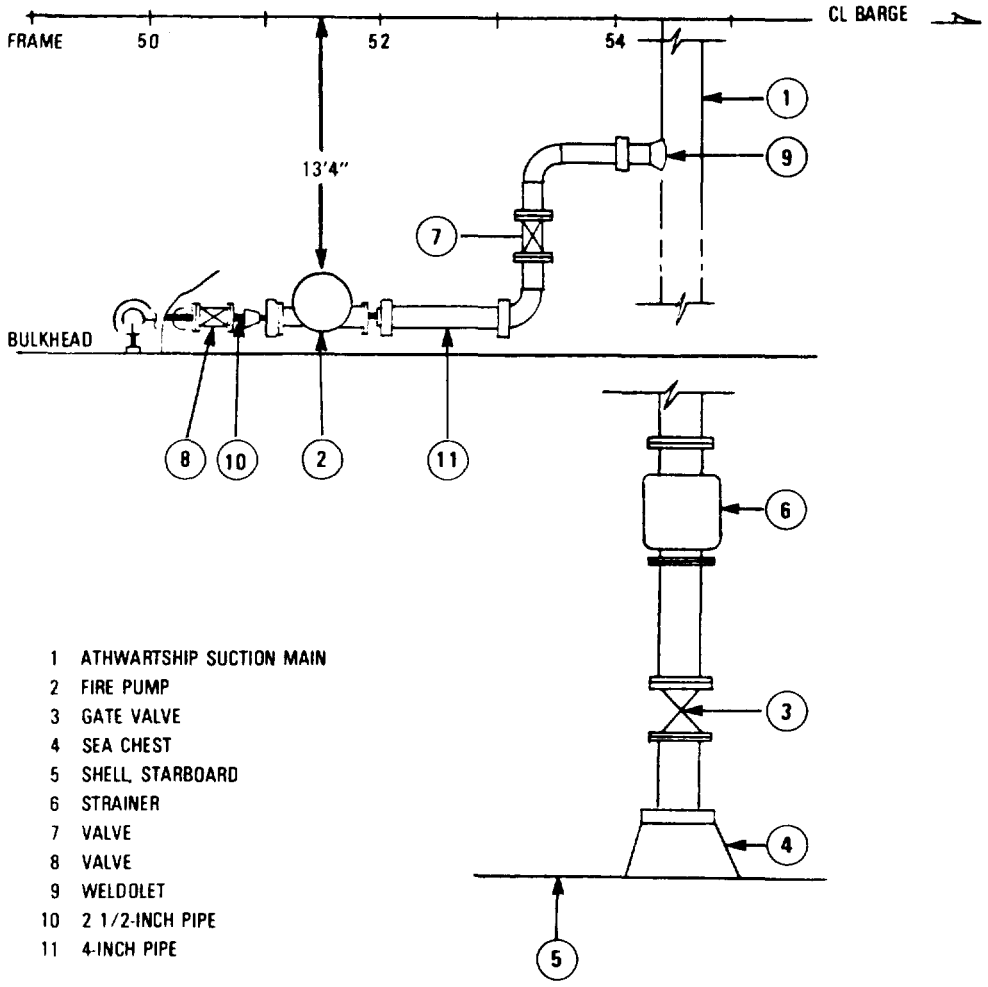
Fixed Fire Station



Seawater is taken from a suction main and pumped under pressure to the fire stations. A weldolet is installed in the suction main, a distance of 8 feet 8 inches outboard to starboard from the barge centerline. The fire pump is connected to the weldolet by a 4-inch pipe. Refer to the following diagram.

The fire-main piping at the fire station in the crew's quarters has a l-inch pressure supply line for pressurizing the galley-quarters area portable eductor. The eductor, operated by pressurized water from the fire pump, is used to drain the galley-quarters area and the storeroom underneath.

Fire Main System



1 ATHWARTSHIP SUCTION MAIN
2 FIRE PUMP
3 GATE VALVE
4 SEA CHEST
5 SHELL, STARBOARD
6 STRAINER
7 VALVE
8 VALVE
9 WELDOLET
10 2 1/2-INCH PIPE
11 4-INCH PIPE

The portable eductor assembly should be stowed in the storeroom underneath the crew's quarters (the eductor assembly can be pressurized from a supply line located in the fire-main piping at fire station 2). The portable eductor assembly consists of–

- Derbyshire 356 low-head eductor, with a 1-inch female pipe thread pressure connection and 1 l/2-inch female pipe thread suction and discharge connections.

Ž25 feet of l-inch pressure supply hose with 1-inch male pipe thread hose fittings.

- 10 feet of 1 1/2-inch suction hose with 1 1/2-inch male pipe thread hose fittings.

- Simmons 406 right-angle foot valve with a strainer and a 1 1/2-inch female pipe thread connection (to be attached to the 10-foot, 1 /2-inch suction hose).

- 50 feet of 1 1/2-inch discharge hose with 1 l/2-inch male pipe thread hose fittings.

ENGINE ROOM SYSTEM

The automatic fire-extinguishing system installed in the engine room is the CO_2 smothering type. This system can also be activated by pulling wire pull handles located at several places in the engine room. This fire-extinguisher system is installed so that it will automatically discharge CO_2 on and around the engines in case of fire. The discharge nozzles are connected by piping to seven 50-pound CO_2 cylinders.

WARNING: Operation of the fire-extin guishing system while personnel are in the engine room could result in injury or death to personnel. Some type of warning should be established to warn personnel when CO_2 is discharging.

The CO_2 smothering system can also be set off from an outside "fire-pull" station located on the main deck on the forward side of the engine house.

PORTABLE EXTINGUISHERS

In addition to the fire-main system, 12 hand-held, portable fire extinguishers are located in brackets at convenient positions. Three types of fire extinguishers are used. Each type is designed to extinguish **a** particular type of fire and is located accordimgly in an area where that specific type of fire is more likely to occur.

The 12 portable fire extinguishers located throughout the barge include five 15-pound CO_2 extinguishers, six 5-pound Halon 1211 extinguishers, and one 20-pound dry-chemical, Purple K extinguisher. Refer to FM 55-501, Chapter 11, for detailed procedures used in fire fighting and the use of portable fire extinguishers.

FIRE PUMP

SPECIFICATIONS

The fire pump motor is supplied with 240-VAC, 3-phase power from the engine room, 240-VAC-load center panel (P-0203). Pump operation is controlled by a motor controller which has low-voltage protection and current-overload features. The fire pump motor is interlocked with the air compressor motor, via the compressor motor controller, to pevent the air compressor from operating when the fire pump is running.

Pump Data

Pump:	
Capacity	165 GPM @ 200 ft TDH
Motor:	
Power requirements	240-VAC, 3-phase, 60-Hz
Current	35 amp
Power output	15 HP
Rotation rate	3,500 RPM

The fire pump can be operated locally from the motor controller or remotely by a push button located on the main deck next to the emergency stations. The local operation is controlled by START-STOP push buttons at the motor controller with the LOCAL-OFF-REMOTE switch in the LOCAL position. The

remote operation is controlled by the START-STOP push buttons located on the main deck with the LOCAL-OFF-REMOTE in the REMOTE position.

OPERATION

Initial inspection

Make the following inspection before starting the pump:

ŽMake sure all wiring connections to the motor (and starting device) match the wiring diagram and produce clockwise rotation as viewed from the top of the motor.

ŽIf the motor has been in storage for an extended time, either before or after installation, refer to the motor instructions before starting.

• Check the voltage, phase, and line-circuit frequency with the motor data plate.

Ž Turn the rotating element by hand to make sure it rotates freely.

• Tighten the plugs in the gage and drain taps; keep the gage cocks closed when not in use.

Ž Check the suction and discharge piping for leaks, and make sure all flange-bolts are securely tightened.

Priming procedure

The pump is not self-priming and must be completely primed (filled with liquid) before starting. The pump operates with a positive suction head.

Prime the pump by opening the suction valve and allowing the liquid to enter the pump casing. Open the air vent at this time and make sure all air is forced from the pump by liquid before closing, Rotate the shaft by hand to free entrapped air from impeller passageways.

CAUTION: Never run the pump dry. Running the pump dry will cause serious damage to the mechanical seal.

Start-up procedure

To start the fire pump, carry out the following steps:

Step 1. Fully open the gate valve in the suction line, and close the gate valve in the discharge line.

Step 2. Fill the suction line with liquid and completely prime the pump.

Step 3. Start the pump locally by depressing the START push button at the motor controller with the LOCAL-OFF-REMOTE control switch in the LOCAL position.

or

Start the pump remotely by depressing the START push button at the station located on the main deck and have the LOCAL-OFF-REMOTE control switch on the controller in the REMOTE position.

Step 4. Open the gate valve in discharge line.

Shutdown

Always close the discharge gate valve before stopping the pump to ensure that the pump is full of water for priming; close the valve slowly to prevent hydraulic shock.

With the control switch at the motor controller in the LOCAL position, depress the STOP push button. If the control switch is in the REMOTE position, depress the STOP push button at the station on the main deck.

For overnight or temporary shutdown periods under nonfreezing conditions, the pump can remain filled with liquid for priming. Make sure the pump is fully primed before starting.

For short or frequent shutdown periods under freezing conditions, keep fluid moving within pump casing and insulate or heat pump exterior to prevent freezing.

MAINTENANCE

To lubricate the motor, remove the grease drain plug (if any) and filler plug on grease fitting. Grease with clean lubricant until grease appears at drain hole or along motor

shaft; 1 1/2 to 3 cubic inches of grease is sufficient. If the pump is operated under standard conditions, the motor should be lubricated every six months.

Periodically inspect the–

- Grease fittings and drain plugs. Grease fittings and drain plugs should be inspected every 30 days for leaks.

ŽMechanical seals. Inspect all mechanical seals every 30 days for indication of leaks. If evidence of seal failure is observed, the seals must be replaced.

ŽWear rings. Wear rings should be inspected every 90 days if the operation of the pump is confined to pumping seawater or fresh water. Rings must be replaced when the diametric clearance between impeller and wear ring exceeds 0.040 inch.

Refer to the following chart for troubleshooting causes and remedies in the maintenance of the pump and its motor.

Troubleshooting Chart: Fire Pump and Motor

SYMPTOM	PROBABLE CAUSE	REMEDY
Pump does not deliver any liquid.	Lack of prime.	Repeat priming as previously described; make sure pump is completely primed with liquid. Make sure all air is bled from pump and suction piping and piping is completely filled with liquid.
	Speed too low.	Make sure power is directly across the line and motor is receiving full voltage. If frequency is too low or if motor has an open phase, make necessary correction; make sure generator is running at full speed.
	Wrong rotation.	Make sure the pump motor is rotating in a clockwise direction, as viewed from top of motor. Check rotation arrow on top of pump volute casing.
	Discharge head too high.	Check piping for friction losses; make sure discharge head matches conditions for which pump was selected (pump rating). Larger diameter piping may correct conditions of excessively high discharge head. Make sure that no obstructions exist in discharge piping.
	Suction lift too high.	Check for obstructions at suction inlet. Check for possible friction losses in suction piping (use a friction table). To determine if static lift is too great, measure suction pressure with a mercury column or gage while pump is operating. Static lift can be reduced either by raising the surface level of liquid being pumped or by lowering the pump.

Troubleshooting Chart: Fire Pump and Motor (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
	Inlet not deep enough in liquid source.	If inlet cannot be lowered or if swirling eddies are created which permit air to enter suction line, chain a board to the suction piping (near inlet). Board will be drawn into whirlpool, smothering the vortex and preventing air funnels from entering line.
	Impeller clogged.	Disassemble pump volute casing, and completely clean impeller passageways.
Pump does not deliver enough liquid.	Suction piping leaks air.	Make sure all flange and valve connections in suction line are airtight. Make sure all leaks are completely sealed.
	Speed too low.	(See above.)
	Discharge head too high.	(See above.)
	Suction lift too high.	(See above.)
	Impeller partially clogged.	(See above.)
	Insufficient pressure to suction head for hot water.	Condition can be determined by connecting pressure gage to suction piping or to gage tap on pump suction nozzle. Gage indicator will oscillate if water is flashing to steam in suction line.
	Wear ring excessively worn.	Inspect case wear ring for excessive wear. If wear ring is defective, replace.
	Impeller damaged.	Inspect pump impeller. If impeller is excessively damaged or impeller vanes are badly worn (eroded), replace with new impeller.
Pump does not produce enough pressure.	Speed too low.	(See above.)
	Air or gases in liquid.	To determine whether gases are present in liquid being pumped (such as marsh gas in swamp water), test liquid in laboratory by simulating suction-line pressure and checking for bubble formation. It may be possible to overrate pump to a point where it will provide adequate pressure, despite existing conditions. A better solution is to install a gas-separation chamber in the suction line near the pump and periodically exhaust accumulated gas.
	Impeller damaged.	(See above.)
	Wear ring excessively worn.	(See above.)
	Impeller diameter too small.	Check with manufacturer's representative to determine if large impeller can be used. Otherwise, reduce pipe friction losses, or increase speed of impeller rotation. (Make sure motor is not seriously overloaded.)

Troubleshooting Chart: Fire Pump and Motor (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
Pump operates briefly, then stops.	Improper priming.	Repeat priming procedure.
	Suction lift too high.	(See above.)
	Suction piping leaks air.	(See above.)
Pump uses too much power.	Suction head less than pump rating.	Reduce outside diameter of pump impeller. Impeller diameter may be turned down on a lathe and rebalanced or replaced with smaller-diameter impeller.
	Liquid too heavy (viscosity or specific gravity).	Use motor with greater horsepower rating or reduced RPM.
	Wrong rotation.	Reverse any 2-phase connections of the motor 3-phase connections.
	Volute casing distorted by piping stress.	Check pump alignment. Examine pump interior for excessive or unusual friction between impeller and casing. Check wear ring and rotating elements, and replace worn or damaged parts.
	Misalignment.	Realign pump and motor, and clean all mating surfaces.
Pump motor won't start (no hum).	Loss of power.	Check fuses; reset thermal protector.
	Open connection.	Check for broken wiring, improper connection.
Pump motor hums, but fails to start.	Excessive overload.	Check for equipment jams, clogging, or freezing.
	Open in starting circuit.	Check starting capacitors for open or short.
	Open in running circuit.	Check running capacitors for open or short.
		Check winding continuity.
	Grounded windings.	Check starting and running windings for grounds.
	Switch contacts not closing.	Check switch operation.
Pump motor fails to accelerate normal load to running speed.	Starting winding remains in circuit.	Switch contact points may be stuck together. Switch actuator may be defective.
	Defective starting.	Check for open, leaking, or dried-out capacitors.
Pump motor starts and accelerates load, but is rough and noisy. Draws very high current (motor not switching out starting capacitors).	Faulty rotating switch actuator.	Check rotating switch-actuator operation.
	Improper location of rotating switch.	Check location of rotating switch actuator.
	Faulty switch.	Check switch operation.

Troubleshooting Chart: Fire Pump and Motor (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
Pump motor starts properly, but will not come up to full speed. Motor speed cycles between the cycles between the switch dropout and cut-in speeds.	Switching speed too low because of faulty or improperly located rotating switch actuator.	Check rotating acutator operation. Check location of rotating switch acutator.
Bearing overheating.	Improper lubrication.	Relubricate motor.
	Worn bearings.	Inspect bearings and replace if necessary.
Pump motor vibration.	Misalignment with equipment.	Check alignment of motor with equipment, and realign if necessary.
	Possible overload.	Check to see that load is not excessive, if so reduce load.

NOTE: For detailed instructions on installation, maintenance, and repair refer to the applicable TM or manufacturer's manual (Reliance Motor's *Instruction Manual,* B-3620-11 for induction motors).